Tri-Basin Irrigator

Volume 17, Issue 7 *August 17, 2017*

Program Information

EQIP & CSP:

EQIP – Projected sign-up deadline for 2018 funds will be mid-October 2017.

CSP – We are currently contracting 2017 pre-approved applications.

NSWCP: NSWCP funds are ONLY available for flow meters and soil moisture sensors at this time.

ENERGY EFFICIENCY GRANT: Signup deadline for 2018 funds will be October 31, 2017. For more information contact Kelley at Rural Development at the Kearney USDA Service Center at 308-237-3118, Ext. 4 or at 308-455-9837.

Calendar of Events

Aug 24: UNL WCREC Field Day & Workshop. See article on page 2 for more info and registration link.

Aug 27: CNPPID 12-week irrigation run schedule ends.

Sept 5: CNPPID Board of Directors Meeting - 9 am

Sept 12: TBNRD Board Meeting -1:30 PM

Sept 12-14: Husker Harvest Days. Goto http://huskerharvestdays.com for more info.

When is My Last Irrigation?

If corn is at Dough, the chart to the right says you need 7.5 inches of water to get corn to maturity. Soybeans at Beginning Seed, you need 6.5 inches. Some of the crops are further along than this. It seems like a long season is left. However, the end is just around the corner. If we don't start managing our soil moisture levels, the end will sneak up on us and we will end the season with more moisture than necessary. Especially if we catch some rain. Then there will be no room for off-season, FREE, moisture.

My observations the last number of years are that corn seems to shut down rather quickly. Moisture that we thought was going to be used was not. We've ended up with more moisture at maturity than predicted.

If you haven't already started utilizing the FREE subsoil moisture, you need to start. Monitor your crop stage, moisture levels, and root depth. Use the predicting example on this page.

In order to learn if that last irrigation you made was worth it or not, here is a suggestion I have. When you want to run that pivot to get that last 0.5-1.0 inch on, just run it half way around or ¾ depending upon how you can capture a yield difference. If a yield monitor and yield map can pick up the slightest yield difference, then one wouldn't need to trial as large of an area. By not watering a portion of the pivot, this will teach us if that last watering made a difference in yield. How will one know this if it's not tried on a field where one can compare the extra water versus the non-extra water.

If you do this, I would like to see the results. Potentially, this could be an easy way to save a 0.5-1.0 inch of water per year without utilizing any other form of irrigation water management.

Curtis's Column

USDA United States Department of Agriculture
Natural Resources Conservation Service

Predicting Last Irrigation:

Needed info: **1.** Available Water Capacity (AWC) of soil, **2.** current amount of plant available water to a four foot depth (unless roots are not that deep due to compaction, too much water early, etc.), **3.** current crop stage, and **4.** normal water use from current crop stage to maturity. This prediction assumes no rainfall to crop maturity. If rainfall occurs, the process must be reevaluated.

The following is a chart for normal water use requirements from various crop stages to maturity.

	Growth Stage	Approx. Days to Maturity	Water Use To Maturity
Corn	Dough (R4)	34	7.5"
	Beg. Dent (R4.7)	24	5.0"
	¼ Milk Line (R5)	19	3.75"
	½ Milk Line (Full Dent)	13	2.25"
	¾ Milk Line	7	1.0"
	Maturity (R6)	0	0.0"
Soy Beans	Full Pod (R4)	37	9.0"
	Beg. Seed (R5)	29	6.5"
	Full Seed (R6)	18	3.5"
	Leaves Beg. To Yellow (R6.5)	10	1.9"
	Beg. Maturity (R7)	0	0.0"

You can get a copy of NebGuide G1871 "Predicting the Last Irrigation of the Season" online at http://extensionpublications.unl.edu/assets/pdf/g1871.pdf.

Predicting Last Irrigation Example

Crop: Corn Growth Stage: Beg. Dent Moisture: 80%

Water Use To Maturity (see chart on left side of page: 5.0 in.

Soil Type: Holdrege Silt Loam = an AWC of 2.25 in. per ft.
(Soil information available at your local NRCS office)

1. AWC x root zone (4 ft. depth) = **9.0 in. Total AWC**
2. Maximum water depletion of 60% x 9.0 in. = **5.4 in. of maximum water depletion in 4 ft. root zone**
3. Current soil water already depleted (measured) = **1.80 in.**
   80% avg. soil moisture to 4 ft. (20% avg. depletion)
   0.20 x 2.25 in./ft. x 4 ft.
4. Remaining plant available water = **3.6 in.**
   (5.4 maximum water depletion minus 1.8 already depleted)
5. Irrigation requirement = **1.40 inches of irrigation water needed for plant to reach maturity.**
   (5.0 in. of water to reach maturity minus 3.6 in. of water available)

Note: This all assumes no rainfall. Should rainfall occur, the process needs to be repeated. It's also recommended to periodically check soil moisture & crop stages and repeat this process through crop maturity.

Soil Health Series: Carbon to Nitrogen Ratios

Attached is an NRCS publication providing information on this topic.

CNPPID NOTES

Safety:

District vehicles have a new safety feature in them as the result of an accident with no injury but one that could have had a tragic outcome. Our patrolman was shutting gates after a recent rainstorm; his pickup slid off the canal road and landed on the inside slope of the canal with the passenger's side in water. He is well trained for this scenario but his newer pickup has electronic door locks and windows. The electronics got wet and caused the lights to blink on and off and the door locks to open and lock on their own. In between lock cycles, he was able to kick the door open and climb out without rolling the pickup. As the door shut behind him, the doors locked for good. Had the vehicle rolled, he might have been trapped. Most of you have these same electronic features in your pickups and you might have a passenger with you. The small gadget pictured below cuts seatbelts, breaks a side window and can save your life. We recommend you have one secured within easy reach of the driver in all of your vehicles.

TRI-BASIN NRD NEWS

TBNRD Reminders Before Irrigation Season Ends:

Drain Your Chemigation Check Valve:

When you are preparing your irrigation systems for colder weather, remember to drain your main line check valve to prevent freezing. This will extend the life of the check valve and may help prevent check valve failure.

Irrigation Water Samples for Nitrogen Management Reports:

If you have crop ground in Phase 2 or Phase 3 of Tri-Basin NRD's Groundwater Quality Management Area, remember to take irrigation water samples. The sample results you get this year will be used in completing your 2018 Nitrogen Management reports.

Year End Flow Meter Readings for Water Use Reports:

As the irrigation season winds down and you are picking up irrigation pipe or bedding down irrigation engines, remember to record the ending meter readings for your Water Use reports.

NEBRASKA EXTENSION EXTRAS

Nebr. Extension Fall Field Day – North Platte, Aug. 24

The 2017 Nebraska Extension – West Central Extension Fall Field Day at North Platte will be on Thursday, Aug. 24, 2017 from 8:00 am – 4:00 pm. This FREE event at the Nebraska Extension Experiment Station located just south of I-80 North Platte exit (402 W State Farm Rd) will feature the new UNL-TAPS irrigation efficiency hands-on experience along with three in-depth educational tracks.

UNL-TAPS (Testing Ag Performance Solutions) began in 2017 to allow producers to learn about the newest irrigation and water management technology using a contest format. Teaming with the Nebraska Water Balance Alliance and AquaMart, this competition offered cash rewards to Nebraska corn producers choosing the best plot combination management decisions. Possible production application decisions included: nitrogen management; hybrid selection; plant population; grain marketing; and risk management. During this Fall Field Day, a grower panel will share their TAPS experience with peers as producers learn what practices proved to maximize efficiency; produced the highest yields; and ultimately which chooses were the cost profitability with the highest return on investment.

Following the panel discussion, Field Day participants will have three in-depth farm water management track sessions from which to choose. These tracks will be: Agronomy; Economics; and Hydrology / Water Management. Morning topics will include: Market Update: Economics of Conservation; Managing through Difficult Times; Deficit Irrigation Research; "I am a Farmer First;" Stretching Groundwater; Soil Water Holding Capacity; and Subsurface Drip Irrigation.

Afternoon sessions will feature: Cover Crops after Winter Wheat; Forages & Cover Crops; Soybean Root Diseases; Bacterial Leaf Streak (corn); TAPS Field site; Herbicide Management; Remote Soil Moisture monitoring; Nutrient & Water Sensors; Western Bean and Corn Cutworms Control; Farm Economic Systems; and UNL Grain Marketing App.

Thanks to 35 sponsors this event is being provided free-of-charge and includes a free lunch and break refreshments. However, pre-registration is very appreciated before Aug. 21 for meal and set-up planning.
Participants have their choice of three different ways to register. Online: *http://go.unl.edu/water-crops*. Or, call Jacque Herrick (308) 696-6740 or email: *Jacque.herrick@unl.edu*.

Nebr. Extension Soybean Plot Tour-Bertrand, Aug. 31

The 2017 Nebraska Extension – On-Farm Research "High Yielding Soybean Plot Seminar" will begin at 5:00 pm in the Pioneer Seed Building on the west edge of Bertrand, NE. This meeting will feature the 3-year UNL In-Depth Soybean Fertility Study conducted on Dennis Gengenbach's farm – Smithfield.

Featured topics will include: How to produce 80+ bushels per acre soybeans?; How much nitrogen to soybeans need?; UNL SoyWater and CornSoyWater soil moisture monitoring; Dicamba Volatilization & Drift; and Defoliating Soybeans.

Special thanks to the Aurora COOP-Bertrand; FMC Chemical; and Pioneer Seeds (Scott Ford) for sponsoring the free meal. However, pre-registration is appreciated for the meal. Please call 308-995-4222 or email: *twhitney3@unl.edu*

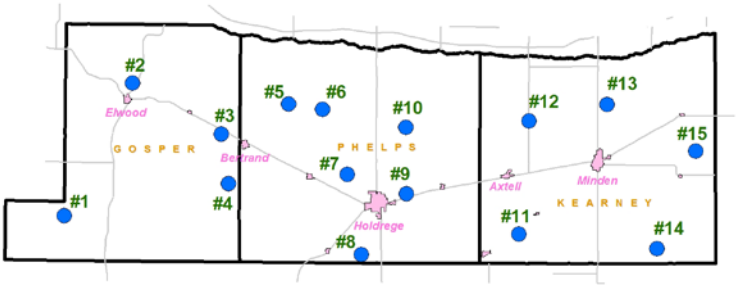
See attached flyer for more details.

NAWMN Crop ET Information

Additional Information and other ET resources can be found at websites listed under "ET Information Sites" below.

Inches of Crop Water Use (ET) = Evaporation x Kc

	July 31 – Aug 6		Aug 7 – Aug 13	
Site	Evaporation	Rain	Evaporation	Rain
1	1.20	0.45	1.10	4.30
2	1.20	1.65	0.90	1.10
3	1.00	1.45	0.70	1.25
4	0.90	2.13	1.40	1.00
5	1.10	1.05	0.70	0.70
6	1.00	0.90	0.80	0.73
7	1.10	0.44	0.90	0.75
8	1.30	1.39	1.05	0.90
9	1.10	0.80	0.90	0.65
10	1.00	0.87	1.10	0.58
11	1.00	1.22	1.00	0.46
12	1.10	0.22	1.00	1.26
13	1.20	0.02	1.00	1.73
14	1.30	0.10	1.10	0.50
15	1.10	0.39	1.00	1.12



2017 Map of NAWMN Sites across the Tri-Basin NRD.

Crop Coefficients (Kc)

Corn Stage	Kc	Soybeans Stage	Kc
2 leaf	0.10	Cotyledon (VC)	0.10
4 leaf	0.18	1st Node (V1)	0.20
6 leaf	0.35	2nd Node (V2)	0.40
8 leaf	0.51	3rd Node (V3)	0.60
10 leaf	0.69	Beg. Bloom (R1)	0.90
12 leaf	0.88	Full Bloom (R2)	1.00
14 leaf	1.01	Beg. Pod (R3)	1.10
16 leaf	1.10	Full Pod (R4)	1.10
Silk – Beg. Dent	1.10	Beg. Seed (R5)	1.10
¼ Milk Line	1.04	Full Seed (R6)	1.10
Full Dent (½ Milk)	0.98	Yellow Leaf (R6.5)	1.00
¾ Milk Line	0.79	Beg. Mat. (R7)	0.90
Black Layer	0.60	Full Mat. (R8)	0.20
Full Maturity	0.10	Mature	0.10

Crop Stage Information

Corn (R3-Milk to R4.7-Beginning Dent stage): At Beginning Dent, kernels are beginning to dent at the base of the ear. Full Dent is when the milk line is ½ way down the kernel. Knowing this will help in determining last irrigation.
Avg. daily water use from Aug 7 – Aug 13 was 0.13"-0.19".

Soybeans (R5-Beg Seed to R6-Full Seed stage): Demand for water and nutrients is large throughout the rapid seed filling period. Environmental stress from now til shortly after R6 (Full Seed) needs to be avoided.
Avg. daily water use from Aug 7 – Aug 13 was 0.13"-0.19".

Aug 7-Aug 13 (15 of 15 NAWMN sites reporting): Average weekly rainfall was 1.14 (range 0.46 to 4.30). Average weekly ET for corn was 1.11 and for soybeans was 0.92.

ET Information Sites

NAWMN Sites:
- http://www.cnppid.com/news-info/weatheret-data/nebraska-agricultural-water-management-network/
- https://nawmn.unl.edu/ETdata/DataMap

CropWatch: http://cropwatch.unl.edu/gdd-etdata
CNPPID: http://www.cnppid.com/news-info/weatheret-data/
Water Use Hotline: 1-800-993-2507

Corn Stage		DESCRIPTION
R4	Dough	Most kernels contain semi-solid, pasty material.
R4.7	Beginning Dent	Kernels at the base of the ear are beginning to dent.
R5	1/4 Milk Line	All or nearly all kernels are dented. Milk line or starch line appears shortly after denting as a line across the kernel when it is viewed from opposite the embryo side and will advance toward the base of the kernel (toward the cob).

Soybean Stage		DESCRIPTION
R6	Full Seed	At least one pod whose cavities are completely filled with green seeds is present at one of the four uppermost main stem nodes that have fully developed leaves.
R6.5	ull seed/yellow le	Leaves begin to yellow, beginning in the lower canopy and progressing upwards.

Lake and River Levels

CNPPID Reservoir Elevation and Platte River Flow data listed below and other locations can be found on CNPPID's website at *http://cnppid.com/wp-content/uploads/2016/06/lakeRiverData.html*.

	August 17, 2017, 8:00 AM	*1 Year Ago*
Capacity of Lake McConaughy	**74.9%**	**NA**
Inflows to Lake McConaughy	**2207 cfs**	**2024 cfs**
Flows on the North Platte at North Platte	**1147 cfs**	**1755 cfs**
Flows on the South Platte at North Platte	**237 cfs**	**189 cfs**
Flows on the Platte at Overton	**2353 cfs**	**747 cfs**

Life is not the way it's supposed to be. It's the way it is. The way you cope with it is what makes the difference.

- Virginia Satir

Websites of Interest

Soil Health:
www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

Climate	*agclimatenebraska.weebly.com*
SAM Registration	*www.sam.gov*
NRCS Nebraska	*www.ne.nrcs.usda.gov*
Central Irrigation District	*www.cnppid.com*
TBNRD Home Page	*www.tribasinnrd.org/*
Farm Service Agency	*www.fsa.usda.gov*
UNL Cropwatch	*cropwatch.unl.edu*
UNL Extension	*extensionpubs.unl.edu/*
K-State SDI Website	*www.ksre.ksu.edu/sdi*
No-till On The Plains	*www.notill.org*

Rainfall

Rainfall amounts listed below and other locations come from NeRAIN which can be found at website *https://nednr.nebraska.gov/NeRain/Maps/maps*.

Location:	Aug 3 – Aug 16	May 1 – Aug 16
Arapahoe 6.9 NW:	**0.90**	**12.71**
Bertrand 6.1 mi. SE:	**2.39**	**11.10**
Funk 4.1 mi. NNE:	**2.62**	**15.12**
Minden 0.855 mi. W:	**2.36**	**16.65**
Minden 8.8 mi. ESE:	**1.90**	**15.31**

Average Rain for May-August in Holdrege = 14.21 Inches

****** If you wish to receive this newsletter via e-mail, or have any questions, comments or ideas, feel free to contact Curtis Scheele at the NRCS office in Holdrege or you can email him at curtis.scheele@ne.usda.gov. ******

USDA - Natural Resources Conservation Service

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309 Smith Street
PO Box 41
Elwood, NE 68937-0041
308-785-3307, Ext. 3

1005 South Brown Street
Minden, NE 68959-2601
308-832-1895, Ext. 3

Central Nebraska Public Power & Irrigation District

415 Lincoln Street
PO Box 740
Holdrege, NE 68949
308-995-8601

Tri-Basin Natural Resources District

1723 Burlington Street
Holdrege, NE 68949
308-955-6688

Nebraska Extension

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Holdrege, NE 68949

308-995-4222

PO Box 146
Elwood, NE 68937

308-785-2390

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Carbon to Nitrogen Ratios in Cropping Systems

Introduction

Carbon to Nitrogen ratio (C:N) is a ratio of the mass of carbon to the mass of nitrogen in a substance. For example, a C:N of 10:1 means there is ten units of carbon for each unit of nitrogen in the substance. Since the C:N ratio of everything in and on the soil can have a significant effect on crop residue decomposition, particularly residue cover on the soil and crop nutrient cycling (predominantly nitrogen), it is important to understand these ratios when planning crop rotations and the use of cover crops in agricultural systems.

Microbial C:N Ratio Feeding Soil Microorganisms

Soil microorganisms have a C:N ratio near 8:1. They must acquire enough carbon and nitrogen from the environment in which they live to maintain that ratio of carbon and nitrogen in their bodies. Because soil microorganisms burn carbon as a source of energy, not all of the carbon a soil microorganism eats remains in its body; a certain amount is lost as carbon dioxide during respiration. To acquire the carbon and nitrogen a soil microorganism needs to stay alive (body maintenance + energy) it needs a diet with a C:N ratio near 24:1, with 16 parts of carbon used for energy and eight parts for maintenance. It is this C:N ratio (24:1) that rules the soil!

If foodstuff such as mature alfalfa hay (C:N ratio of 25:1) is added to the soil (see Table 1), the soil microorganisms will consume it relatively quickly with essentially no excess carbon or nitrogen left over. The hay has an almost perfect balance of carbon to nitrogen that soil microorganisms (24:1) need.

What would happen if we added a foodstuff with a higher C:N ratio to the soil (see Table 1), such as wheat straw with a C:N of 80:1? Since wheat straw contains a greater proportion of carbon to nitrogen than the 24:1 perfectly balanced diet soil microorganisms require, the microbes will have to find additional nitrogen to go with the excess carbon to consume the wheat straw. This additional nitrogen will have to come from any excess nitrogen available in the soil. As soil microorganisms tie up excess nitrogen (immobilization), this situation could create a deficit of nitrogen in the soil until some of them die, decompose, and release nitrogen (mineralization) contained in their bodies, or some other source of nitrogen becomes available in the soil.

Conversely, what would happen if we added a foodstuff with a lower C:N ratio, such as a hairy vetch cover crop with a C:N of 11:1? Since the vetch contains a lesser proportion of carbon to nitrogen than the 24:1 perfectly balanced diet soil microorganisms need, the microbes will consume the vetch and leave the excess nitrogen in the soil. This surplus nitrogen in the soil will be available for growing plants, or for soil microorganisms to use to decompose other residues that might have a C:N ratio greater than 24:1.

Everything else being equal, materials added to the soil with a C:N ratio greater than 24:1 will result in a temporary nitrogen deficit (immobilization), and those with a C:N ratio less than 24:1 will result in a temporary nitrogen surplus (mineralization). This is why composting operations strive to achieve a blend of materials with a C:N ratio of about 30:1… so the resident microbes can readily decompose the compost pile leaving a little food and structure left over to feed and shelter the microbes after the compost is applied to the soil.

Next, let's examine C:N ratios from a practical perspective for crop production and soil health.

C:N Effects on Soil Cover

The faster crop residues are consumed by soil microorganisms the less time those residues will be covering the soil surface. Crop residues on the soil surface are important for protecting soil aggregates from the destructive force of raindrops hitting the soil, conserving soil moisture, and providing habitat for arthropods that shred crop residue and eat weed seeds. While it is important to maintain soil cover, it is also essential that those same residues decompose to release plant nutrients and build soil organic matter. Therefore, it is important to pay attention to crop residue C:N ratios to maintain soil cover when desired, yet allow the cover to ultimately break down and be recycled.

A cropping system of continuous no-till wheat certainly provides good soil cover, as wheat produces a fair amount of residue with a relatively high C:N ratio (80:1) that decomposes relatively slowly. However, such a cropping system does not allow the crop nutrients in the wheat straw to become readily available to soil microorganisms or plants. By adding a relatively low C:N ratio crop such as hairy vetch (11:1) to the rotation, nitrogen will be available to the soil microorganisms, thus allowing them to break down the wheat straw more quickly. Likewise, a cropping system of continuous no-till peas would result in very little soil cover as soil microbes would consume the pea residue (C:N of 29:1) relatively quickly, as not much additional nitrogen would be necessary for decomposition of the residue to take place.

C:N Effects on Nutrient Cycling

It should now be apparent from the discussion of C:N ratios and soil cover that management choices must strike a balance between crop residues covering the soil and nutrient cycling. An awareness of crop C:N ratios is necessary to select crop types and keep a cropping sequence on the right path toward sustainability, that of the ultimate C:N ratio of 24:1 that supports soil microorganisms.

Managing residues so they cover the soil when a growing crop is not providing soil protection requires some planning and experimentation to achieve a proper balance. If crops with high C:N ratios are grown too frequently in the rotation, residues will accumulate on the soil surface, and nitrogen for crop growth may be scarce unless supplemented with other sources of nitrogen. This may result in poor crop performance during times when soil microorganisms tie up nitrogen while working to decompose high C:N ratio crop residues.

Influence of Cover Crops

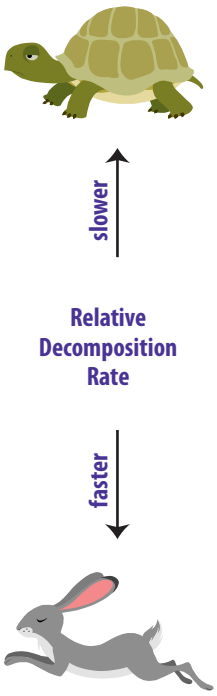
Cover crops added to a cash crop rotation can help manage nitrogen and crop residue cover in a cropping sequence. A low C:N ratio cover crop containing legumes (pea, lentil, cowpea, soybean, sunn hemp, or clovers) and/or brassicas (turnip, radish, canola, rape, or mustard) can follow a high C:N ratio crop such as corn or wheat, to help those residues decompose, allowing nutrients to become available to the next crop. Similarly, a high C:N ratio cover crop that might include corn, sorghum, sunflower, or millet can provide soil cover after a low residue, low C:N ratio crop such as pea or soybean, yet decompose during the next growing season to make nutrients available to the following crop.

Conclusion

Understanding carbon to nitrogen ratios of crop residues and other material applied to the soil is important to manage soil cover and crop nutrient cycling. Providing quality habitat for soil microorganisms should be the goal of producers interested in improving soil health. Soil is a biological system that functions only as well as the organisms that inhabit it.

Table 1. Carbon to nitrogen ratios of crop residues and other organic materials

Material	C:N Ratio
rye straw	82:1
wheat straw	80:1
oat straw	70:1
corn stover	57:1
rye cover crop (anthesis)	37:1
pea straw	29:1
rye cover crop (vegetative)	26:1
mature alfalfa hay	25:1
Ideal Microbial Diet	**24:1**
rotted barnyard manure	20:1
legume hay	17:1
beef manure	17:1
young alfalfa hay	13:1
hairy vetch cover crop	11:1
soil microbes (average)	8:1



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Prepared by the USDA NRCS East National Technology Support Center, Greensboro, NC, in cooperation with North Dakota NRCS

January 2011

Nebraska Extension—On-Farm Research
"High Yielding Soybean Plot—Bertrand"

Free Registration and Meal

For meal count, pre-registration is appreciated by Tuesday, August 29.

Contact UNL Extension in Phelps County,

(308) 995-4222
or
twhitney3@unl.edu

There is no fee for this conference, courtesy of the following sponsors:

University of Nebraska-Lincoln Extension

AURORA COOPERATIVE

FMC

DUPONT

PIONEER

THURSDAY, AUGUST 31, 2017

Pioneer Seed Building West Edge of town Bertrand, NE

5:00 pm

"How to produce 80+ bu./A soybeans?"
"How much nitrogen do soybeans need?"

Patricio Grassini—Nebraska Extension Agronomy Professor
Nicolás Cafaro La Menza—UNL Research Associate
Dennis Gengenbach - UNL—3 year study cooperator

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5:45 pm

"SoyWater and CornSoyWater"

James Specht—Nebraska Soybean Physiologist

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6:15pm

"Dicamba Volatilization / Drift Update"

Todd Whitney—Nebraska Extension Educator

Meal Sponsored by:

Aurora COOP—Bertrand
FMC Chemical Company
Pioneer Seeds—Scott Ford

7:00 pm

"Defoliating Soybeans"

Bob Hurst—Aurora Cooperative—Bertrand

University of Nebraska Lincoln